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SOME REMARKABLE FORMS AND ABERRATIONS IN THE SUBGENUS *ZERENE* HÜBNER (LEPIDOPTERA, PIERIDAE)

By the late Miss Janet Riddell.

Manuscript received 4th April, 1940.

Read 6th November, 1940.

With Plates 1 to 3.

In North America two species of the *Colias* subgenus *Zerene* Hübner occur, *caesonia* (Stoll) and *eurydice* (Boisduval) (1). The former is widespread in eastern United States, and ranges southward into South America. The latter species, *eurydice* Bdv. as generally looked upon, is quite restricted to the State of California. Lepidopterists are familiar with the variety of forms and aberrations which occur rather frequently in these two species. The subject of this paper is a review of the variation of *eurydice* accompanied by an account of my field experience with these, and the descriptions of several new forms and aberrations.

In the preparation of this manuscript I received the kind assistance of several friends and entomologists. Especially to Mr. E. P. Van Duzee, Curator of Entomology, Mr. Edwin Ross, Assistant Curator, and Professor E. C. Van Dyke, all of the California Academy of Sciences in San Francisco I express my appreciation and gratitude for their courteous advice and assistance. To Mr. John W. Johnson of Berkeley, California, are due thanks for his interest and willingness in criticising the manuscript, and in preparing the inflated larvae; also to Mr. Erich Walter of Anaheim, California, and to those other friends whose names are not mentioned here, but who have helped in many ways during these past years.

It is of my collecting experiences and observations of the second brood over a period of twelve years in the mountains of southern California that I especially write. Situated at an altitude of 5000 feet in the San Bernardino Mountains is the Santa Ana River Control. The Control itself was done away with a few years ago when the road was widened, but the place is still known by that name. This has been my headquarters, and most of my collecting has been done within a two-mile radius of it.

The season of the second brood starts at some time near the second or third week of June, according to the weather, which determines whether the season is early or late. In the first part of the season the males are much more abundant than the females. The latter average about one in every ten specimens collected. In 1937 it was noticeably difficult to obtain a pure yellow female, most of them having three to four small black spots near the outer margins of the primaries—which mark the beginning of the form *masumbrosus* Gunder (7). The following season this tendency no longer manifested itself. One may recognise the season to be at its height when the more brilliant individuals of *eurydice* begin to appear about the third week of July. These are very striking, being much larger and of brighter colour than the average, and they appear only at intervals. Towards the end of the season the

males become quite scarce; the females, on the contrary, are much more abundant, and feed one to two hours later each day than the males. It is always wise to watch these females closely for aberrations and for the form *masumbrosus*.

In the second brood *bernardino* (Edwards) (4) is the first atypical form to appear. Between it and the typical male *eurydice* there is an interesting relationship which I have noticed particularly. *bernardino* Edwards is always the first to appear, and is more abundant at that time than typical *eurydice*, the ratio being about thirty to one. As time goes on, it becomes equal; while towards the end of the season, the majority of the specimens taken are *eurydice*, scarcely a *bernardino* being seen.

The next atypical form to appear is *masumbrosus*. Between it and the typical female a relationship similar to that between *bernardino* and the typical male does not exist. *masumbrosus* is at no time abundant, but stray specimens may be captured at intervals through the season. Towards the end of the season it occurs most frequently. In this respect it behaves as do the white forms of *Colias eurytheme amphidusa* and *Catopsilia eubule senna*, which appear most frequently in the late summer, as I have found in rearing many hundreds of these two species.

There has been much speculation over the form *masumbrosus*, some lepidopterists thinking it to be the result of the interbreeding of *eurydice* with *caesonia*. This I am unable to believe. *caesonia* is much too rare in this region, only stray specimens being taken now and then, or about eight to ten during twelve to fifteen weeks collecting; while *eurydice* flies in thousands.

Until *masumbrosus* is actually bred from eggs known to have been laid by one female, I think its origin must remain obscure. I have tried all ways to induce a female to oviposit in captivity, sacrificing nine well-marked *masumbrosus* one season alone without any success. On one occasion I carefully collected three eggs laid by a *masumbrosus* and reared them separately, but they all turned out to be males !

I had a most interesting experience towards the end of the season of 1937 when on September 5 I collected five newly-emerged *masumbrosus* at one place. On September 6 at the same spot I took four more perfect, newly-emerged specimens. All of these were heavily and beautifully marked. This was most unusual, but it seemed possible that they all may have come from eggs laid by one female. Although close watch was kept on the spot for ten days no more were found. It was an open space surrounded by heavy brush and timber, including many shrubs of *Amorpha californica* Nuttall, which is the food-plant of the " dog-face " caterpillar.

The other forms and aberrations of the species appear much more infrequently. *newcombi* Gunder (6) and *doudoroffi* Gunder (8) are very rare. They occur at no particular time. *lineainita* Gunder (7) and *fanniae* Gunder (5), however, are more often met with, and the possibility of finding them is greatest from midseason onward. This is the time when the very brilliant forms are appearing. I have observed that late July and the first days of August are favoured for most of the freak variations. An exception to the rule are the dark (melanistic) forms. These become most frequent just before the season's close.

Last in order is the other species, *caesonia* (Stoll). It is never abundant, and only odd ones are to be taken, beginning about midseason. Towards the end of the season it is somewhat more plentiful. Being a much swifter flier than *eurydice*, it is difficult to capture. *caesonia* seems to be establishing itself

in coastal southern California, having reached there from Arizona through the now-cultivated Imperial Valley.

I have reared the forms *eurydice*, *bernardino*, *lineainita*, *marginalis* Riddell, and *masumbrosus*, also the species *caesonia*, as well as many aberrations of both species. These include *newcombi* and *fanniae*. All the rearing I have done has been from eggs and caterpillars collected on the food-plant. During a season these amounted from two to seven hundred.

The eggs are easily collected from the *Amorpha* bushes. Many times I have observed the females oviposit and then collected the eggs immediately afterwards. During the season of the second brood eggs are laid continuously until the days become too cold, or frost comes. Early in the summer the eggs are laid on the foliage of the top and middle branches of the shrubs; but towards the end of the season when the leaves of the upper parts are turning colour and are old, the females seek out the little young shoots at the bases of the bushes upon which to oviposit.

Whether the eggs which have been laid late in the autumn near the ground survive through the winter, I have never been able to determine. When such eggs are taken to lower warmer altitudes, their development is undisturbed, and butterflies are produced from them.

Rearing the larvae has not been easy. *Amorpha californica* is difficult to keep in fresh condition. Usually it wilts immediately after being plucked, and will not keep in water. When raising caterpillars, I was successful only by confining them on foliage in an empty fifty-pound lard can over which the lid was fitted tightly. The food-plant was changed every second or third day, and the chrysalids removed as they formed. These were stored until emergence in cardboard boxes. Rearing the larvae under such conditions would seem to have an effect later upon the coloration of the males, as I have observed that the males from caterpillars reared in this manner are less brilliant than those collected in the field. The females, however, are not affected.

During these many years that I have been collecting the caterpillars, I have never been able to detect any differences between larvae that could be associated with the variations of the adults. I have discovered, however, still another colour phase of the larva in addition to those mentioned by Edwards (4) and by Comstock (2). This new phase is illustrated on plate 3, fig. c. To me it is the most beautiful of all, especially immediately after ecdysis when three-quarters grown. It is distinguished from the others by the presence of a yellow band immediately anterior to the black band on each segment. This extends across the dorsum almost to the lateral white and orange line on each side. The first larvae with this coloration that I found, I reared separately from all others, thinking that I had discovered, possibly, the secret of *masumbrosus*. But I was disappointed again when the adults proved to be just ordinary males. The phase occurs only with the greatest rarity.

The caterpillar of *eurydice* is rarely parasitised, only three or four examples being found in a season. The parasite is a small hymenopteron the larvae of which emerge from the caterpillar and spin pale yellow cocoons on leaves and twigs on which the skin of the host is resting. The greatest enemies of the caterpillars, however, are the grasshoppers (*Dissosteira carolina* (Linn.)), which hunt over the shrubs of *Amorpha californica*. Many times they have seized larvae before I could collect them from the bushes.

Collecting the adults is easy, by virtue of their feeding habits. Moist soil attracts many of them, and several species of flowers are particularly favoured. In addition to *Senecio* and a little blue gilia (a species of *Navarretia*), they are

very fond of thistle blooms and of the wild sunflowers. Once they have become preoccupied with feeding, they are readily captured.

When one is collecting *eurydice*, the males of the species *Colias eurytheme amphidusa* Bdv. can be very annoying. They fly with *eurydice* and feed at the same little flower, the small blue gilia, that grows along the roadsides and in great patches in open spaces. When collecting, one is able to look ahead and see *eurydice* feeding on the blossoms undisturbed. But often before one reaches them, a male *amphidusa* comes along and flies to each butterfly as if to inform it of one's approach. Then all the butterflies rise up, and one must wait until they settle again before collecting may be continued.

The butterflies have long hours of flight. They begin to fly as early as six-thirty or seven o'clock in the morning if the day is hot, and continue until between three and four in the afternoon. Their flight is not continuous, however, for butterflies may often be observed taking rest by roosting in bushes, but they readily take flight when one passes them. Their favourite roosting-places are the manzanita bushes. As the under-surfaces of the males resemble closely the yellow-spotted leaves of these bushes, this habit may have protective significance. These leaves are those which turn yellow in the interior of the bushes and which are the first to fall.

The male butterflies are always the first to appear in the morning. The females begin flight about an hour later. As the season progresses, the butterflies do not fly so early, and in the latter part the females, as has been mentioned, fly one to two hours later in the afternoon than the males. The males frequently are to be seen chasing the females on the wing, seeking to mate with them. Sometimes three or four pursue one female. When the female is caught, the butterflies fly off to some nearby bush. I have observed males chasing *masumbrosus*.

The adults are not without their enemies also. Grasshoppers prey upon them, and are very troublesome when one is collecting. Several times I have caught a butterfly in my net only to experience a grasshopper making a jump at the same time. Having caught the two, I would discover that by the time I had reached for the butterfly, it had been devoured by the grasshopper. Lizards too take their toll. On one occasion I had a very interesting and amusing experience when both a lizard and I stalked the same butterfly. The butterfly had settled on a moist piece of ground leading from a gutter by the side of the road. Concealed by brush about four yards behind the butterfly, I crept towards the spot where I had seen it settle. Not being able to locate it, I was preparing to retrace my steps to the road to note the place anew, when a lizard dashed up quickly with a freshly caught " dog-face " in its mouth. The head of the butterfly was in the lizard's mouth, and its wings almost fully opened, as if it had attempted to escape. The lizard stopped short, retaining its hold on the butterfly, and remained motionless for over two minutes. A slight movement on my part finally sent it scurrying into the brush still carrying the butterfly, and I did not see it again. The capture of the butterfly would have been interesting to witness, and only the bushes prevented me from doing so.

The encounter with the lizard offered a solution of the problem of the little heaps of butterfly wings I had often found at these moist spots. These previously had been unexplainable. The lizards would seem to consume the bodies only, biting off the wings first and discarding them. The grasshoppers, on the other hand, eat all parts of the butterflies, and so quickly that it is not easy to follow their movements. The butterflies become so absorbed in

drinking that they would make easy prey for the quick-moving lizards. Frequently I have approached drinking butterflies unconcealed, put my net over them, and then had to drag it along the ground to make them rise.

Capturing the rare forms has yielded experiences such as every collector hopes some day to have. On seeing the specimen figured on plate 1, fig. 4, flying towards me, I mistook the black markings to be injuries to the wings, and exerted little effort to capture it—striking at it more for practice than from desire to catch it. Luckily it was swept into my net, for it proved to be a most striking new form.

The specimen figured on plate 1, fig. 9, I took just one month after the above. The day was rather cloudy, and few butterflies flying. In fact, I took only nine other specimens. I noticed a butterfly getting moisture. It looked rather pale on the underside, and thinking it was, perhaps, a freak male, I crept up and succeeded in getting it. On taking it from the net, and opening the wings with my forceps I experienced the greatest surprise in all of my years of collecting. There in my hand lay a perfect gynandromorph ! Collecting was over for the day !

The specimen figured on plate 1, fig. 3, also gave me several minutes of excitement. On a *Senecio* bush were five females. This bush grew through a barbed-wire fence, half on each side. As the females were busy on the blossoms and unfrightened, it was possible to examine them closely. Fig. 3 hovered near the centre. I found on placing my net that the wire held the net two inches above the butterfly and it was not possible to hold the bag of the net up. Fortunately the butterfly flew into the net in spite of its chances of escape, and I thus procured a specimen to fill in the gap in the series between figs. 2 and 4, plate 1. Fig. 7, plate 1, was caught in the same way, but it was the only butterfly on a *Senecio* plant that was all on the other side of a barbed-wire fence. It was necessary to reach over the top of the fence to capture it.

To me the " dog-face " is the most fascinating as well as the most beautiful of our California butterflies. Because of its great variability, there is the possibility that many rare and interesting aberrations will be found. Females with the black dog's head may be more frequently met with, while the males show every promise that the " dog's-head " on the primaries may appear sometimes completely blocked out. But such prizes are not easily won. The specimens which I have taken are the product of careful collecting over a period of eight to twelve weeks every year for twelve years. For one interested in following the sequence of variations in a species, the " dog-face " would seem to offer many possibilities. One never knows what next may be found within the net. No two seasons of the many I have spent in the mountains have been the same. And when the season has drawn to its close, I always have left the mountains with much regret, which was tempered only by anticipation of what another season might bring.

Discussion of the Forms Illustrated in the Plates.

On the plates accompanying this paper are illustrated the variations that occur in both sexes. All specimens figured are in my collection. In the selection of specimens for figuring, it was impossible to show in detail the great range of variation because of the limitations imposed by space requirements and costs of reproduction. In consequence, I was obliged to select those forms illustrating unusual developments or combinations of known types of variations, and those displaying patterns which are new. For comparison of these speci-

mens with the typical patterns of both sexes, the gynandromorph (plate 1, fig. 9) furnishes a happy reference specimen, in as much as it illustrates almost perfectly a female pattern on the left side which departs from the typical only by the appearance of the faint black dashes in the nervule interspaces, and a typical male pattern on the right. The three larvae figured on plate 3 illustrate three colour phases of the caterpillar, including the newly discovered yellow-banded form.

Plate 1 : Forms and aberrations present in the female *Zerene eurydice* Bdv.

Figs. 1, 2, and 3 represent intermediate minor aberrations of a type culminating in number 4 in the formation of the complete black " dog's head " on the primaries of the female. This specimen may be described as follows :—

Zerene eurydice Bdv. ab. **nigrocapitata** ab. n.

♀. Superior surface. *Primaries*: ground colour of clear yellow, characteristic of typical female, having an area of black scales forming a black " dog's head " in the position corresponding with that of the yellow " dog's head " in the male, the shape of the " dog's head," however, not quite the same as in the male; the black discal spot characteristic of the female almost obscured, a patch of yellow scales forming an " eye " spot posterior to the position of the discal spot; the black " dog's head " most densely coloured in the discal cell; distal to the " head " a row of faint, short dashes of black scales in the nervule interspaces; costal margin yellow, with scattered black scales, costal and outer margins fringed with roseate and black scales; black points at the ends of the nervules; inner margin yellow, with black scaling towards base of wing; wing base yellow. *Secondaries*: slightly more orange-yellow than in most females, otherwise identical with typical specimens.

Inferior surface. *Primaries*: slightly more orange-yellow than in typical specimens, with pronounced roseate coloration along costal and outer margins; median nervules interspaced with faint roseate dashes. *Secondaries*: more orange-yellow than the primaries, with dense roseate scaling along the costal margin, a row of six dashes of the same colour in the nervule interspaces; a streak of roseate colour extending from the base of the wing through the cell and meeting the dash of the interspace distal to the cell; a second streak from the wing base extending to the dash in the interspace posterior to the cell; outer and anal margins with a fringe of roseate scaling.

Holotype female, California: Mill Creek Canyon, San Bernardino Mountains, 19.viii.1935, 5000 feet. Figured : plate 1, fig. 4.

This aberration represents an extreme departure from the characteristic female pattern in which the " dog's head " of the male sex not only appears, but in reverse coloration. Its gradual development may be seen readily in figs. 1 to 3, the pattern being definitely suggested on the right primary of fig. 3. The inferior surfaces in each of the specimens, figs. 2 to 5 inclusive, show a great similarity, and resemble those of form *rubrosuffusa* Riddell, plate 2, fig. 8. This pattern is deepest on fig. 1, slightly less on figs. 2 and 3, and appears only feebly on fig. 4.

With respect to the specimens which seem to represent the initial phases of *nigrocapitata*, it is important to call attention to Gunder's aberration *fanniae* (5). In this ♂-form there is a strong suffusion of black with delicate blue reflections over the yellow areas of the cell. Gunder suggests that this tendency may in turn affect the female, figuring as an example a female that would seem to resemble fig. 1, plate 1, rather closely. His opinion that this colour phase in the female is homologous to that in the male which he has termed *fanniae*

would seem to be a very hypothetical one, in view of the marked dimorphism of the species. Until it is known what predisposing factors are responsible in the male for producing *fanniae*, and their action is tested on the female to determine the effect on the female coloration, one can scarcely homologise the colour variations in the two sexes, and the attempt to erect this female type of variation, which he figures, as the female expression of *fanniae* would seem unsound.

A consideration of a long series of male *fanniae* shows this variation to develop through a progression of dark scaling from the wing base outward, the discal " eye " spot being the last portion to be involved, and frequently remaining distinct even under very heavy black extensions. The *nigrocapitata* would seem to develop as an extension of the discal spot itself—first distally towards the outer margin—then anteriorly towards the costal margin, and finally posteriorly. The base of the wing is not involved. The specimen that Gunder figures as a female *fanniae* (see reference number 7), therefore, would seem more properly to be an early phase of *nigrocapitata*. The heavily marked *masumbrosus* of plate 1, fig. 8, would seem to represent more possibly the female counterpart of *fanniae*, if one wishes to identify a female variation with the one in the male. In this specimen the basal areas of black encroach very much on the cell in just the fashion that Gunder describes in the male *fanniae*.

Fig. 5 shows an aberrant female with pale cream primaries. This pale coloration is a phase in the development of the albino ♀-f. *doudoroffi* Gunder (8).

Fig. 6 is of a female with the costal and outer margins of the primaries margined with greyish-black, but without any indication of the " dog's head " pattern. It is described below :—

Zerene eurydice Bdv. form **marginata** form. n.

♀. Superior surface. *Primaries* : ground colour clear yellow, of a tint characteristic of the female ; costal and outer margins bordered with black and pale scaling, giving a grey border to the margins. A row of three very faint black dashes in the nervule interspaces ; inner margin with black scaling near wing base ; base of wing with black scaling. Secondaries : immaculate, differing in no way from the typical females.

Inferior surface. *Primaries* and *secondaries* with the roseate markings of the bases of the wings heavier than in typical females, otherwise with typical pattern.

Holotype collected 31.vii.1938. Figured : plate 1, fig. 6. Seven paratypes collected or reared : ex p. 10.viii.1937 ; ex p. 15.vii.1937 ; 27.vii.1938 ; 24.viii.1937 ; ex p. 23.vii.1936 ; 24.vii.1935 ; and 30.vii.1929. All specimens, California : San Bernardino Mountains, 5000 feet above sea-level.

Fig. 7 is a very large specimen of an intermediate form of *masumbrosus*.

Fig. 8 is a very heavily marked specimen of *masumbrosus* Gunder. It has some of the features of the aberration ♂-f. *fanniae* Gunder. The typical *masumbrosus* is much lighter. Such dark forms are rarely found, whereas the typical form is more frequently met with. I have five examples of this very dark form in my collection.

Fig. 9 illustrates a perfect gynandromorph of *Zerene eurydice* in which the female characteristics are present on the left side, and the male features on the right. The division of secondary sexual characters is shown not only by the wings, but also by the pubescence of the thorax, the colour of the abdomen, and the symmetry of the head.

Plate 2: Forms and aberrations present in male *Zerene eurydice* Bdv.

Fig. 1 is a new aberration complementing form *lineainita* Gunder. The secondaries bear yellow lines on the nervules. It is described as :—

Zerene eurydice Bdv. ab. **flavolineata** ab. n.

♂. Superior surface. *Primaries*: differing from the typical only in the shape of the "dog's head" which is distinguished by the reduction of the yellow areas in the proximal ends of the nervule interspaces, by this the "nose" of the "head" being shortened. *Secondaries*: ground colour more strongly orange-yellow than in the typical male; on each nervule a line of clear lemon-yellow scales extending from the discal cell to the margin.

Inferior surfaces. *Primaries* and *secondaries* as in typical specimens.

Holotype reared from a larva, CALIFORNIA: San Bernardino Mountains, 5000 feet above sea-level. Imago emerged 12.viii.1933. Holotype figured: plate 2, fig. 1. Three paratypes collected: 20.vii.1931, 21.vii.1936, and 3.viii.1936, in the same locality.

Figs. 2 and 3 are extreme aberrations showing on the secondaries a combination of the forms *lineainita* Gunder and *bernardino* Edw. The ground colour of the secondaries of fig. 2 is an unusually deep orange, while that of fig. 3 is the tint more common in male *eurydice*. The border in fig. 2 is discontinuous, while in fig. 3 it is continuous with a heavy sprinkling of black scales in the nervule interspaces.

Fig. 4 illustrates a very heavily marked *fanniae* Gunder in which the black has encroached sufficiently upon the "head" largely to obscure it. This is a much more advanced form than that figured by Gunder (5) as the type of *fanniae*.

In fig. 5 the entire "head" is sprinkled densely with black scales, the cell, however, being less obscured than in fig. 4.

Fig. 6 illustrates the male aberration *newcombi* Gunder (6) in the form *bernardino* Edw.

Fig. 7 combines the aberration *newcombi* Gunder with the dark shading of the "head" of aberration *fanniae*.

Fig. 8 illustrates the inferior surfaces of a new colour form described below :—

Zerene eurydice Bdv. form **rubrosuffusa** form. n.

♂. Superior surfaces. *Primaries* and *secondaries* as in typical male.

Inferior surfaces. *Primaries*: the roseate markings of typical specimens replaced by stronger markings of a darker red; ground colour orange-yellow as in typical specimens. *Secondaries*: characterised by an extension and fusion of the roseate markings, the tint differing from the typical, being dark red, as in primaries; ground colour more orange than in typical specimens; costal margin with a dense border of red extending to and ending in the first spot of the arcuate row of seven red spots in the nervule interspaces; outer margin fringed with red, with red points at the ends of the nervules; spreading between the arcuate row of red spots a suffusion of red scaling extending towards the base of the wing, this suffusion heaviest between spots three, four, and five, forming a patch of red extending into the cell, and as a streak to the base of the wing.

Holotype 13.vii.1937, CALIFORNIA: San Bernardino Mountains, 5000 feet above sea-level. Three paratypes collected: 26.viii.1935, 4.viii.1936, and

23.vii.1935, in the same locality. Holotype figured: pl. 2, fig. 8; paratype number 1: pl. 2, fig. 9 and pl. 3, fig. 7.

This form, *rubrosuffusa* Riddell, represents a tendency to vary from the typical by developing fused areas of red scaling on the inferior surfaces, particularly of the secondaries, replacing the light roseate markings of typical specimens. It is quite different from the form *rosa* M'Neill (12) in *caesonia* in colour pattern, the latter, moreover, being a seasonal form. The roseate markings of the under-surfaces of the wings are a character common to both sexes. And in both sexes the development of the red colouring exists in many degrees, reaching its climax in an almost complete suffusion, in the secondaries, of the proximal ends of the nervule interspaces and discal cell to the base of the wings. The form *rubrosuffusa* is well illustrated, in addition to the holotype, in fig. 7, pl. 3. This same specimen, moreover, exhibits the pattern of ab. *fanniae* on its superior surface, which is figured on pl. 2, fig. 9.

Plate 3: Forms and aberrations present in male *Zerene eurydice* Bdv.

Fig. 1 illustrates a very deep orange male.

Fig. 2 shows a male combining both the form *bernardino* Edw. and form *lineainita* Gunder in the secondaries. The primaries are typical *eurydice*.

Fig. 3 illustrates a male combining the form *bernardino*, form *lineainita*, and aberration *fanniae*.

Fig. 4 is a form *bernardino* Edw. with unusually widely bordered secondaries.

Fig. 5 illustrates form *bernardino* and aberration *fanniae*.

Fig. 6 illustrates a form *bernardino* with the broadest border on the secondaries that I have ever taken or seen. The black border is interrupted at the nervules by lines of yellow scales which extend across the border to the wing margin.

Fig. 7 is the inferior surface of paratype number 1, form *rubrosuffusa* Riddell. The superior surfaces are figured on plate 2, fig. 9. This is indeed a most remarkable butterfly.

Fig. 8 illustrates an unusually clear "face" on the primaries, the heavy black lines generally found on the "dog's head" of more typical *eurydice* being very faint. The secondaries show a discontinuous band of black on the margins of the outer angles—a weak development of the *bernardino* pattern.

Larvae.

Fig. a. The wholly green larva most commonly met with and described by Edwards (4).

Fig. b. The not uncommon black-banded larva described by Edwards (4).

Fig. c. The newly discovered yellow-banded larval form. This is the most beautiful colour form, especially immediately after ecdysis of the three-fourths-grown larva. This colour form is a great rarity, only six specimens of this type having been found in slightly over seven hundred caterpillars.

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Essential Data of the Specimens Figured on the Plates.

Unless otherwise stated, all specimens and larvae were collected by me in the San Bernardino Mountains, California, at an elevation of 5000 feet. The specimens are in my collection at Los Angeles, California.

FORMS AND ABERRATIONS OF *Zerene* Hübner.

FORMS AND ABERRATIONS OF *Zerene* Hübner.

1
2
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4
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6
7
8
a
b
c

Plate 1.

Fig. 1. Reared from a larva collected in Griffith Park, Los Angeles, California; emerged 10.v.1928.
2. Reared from a larva; emerged 6.viii.1937.
3. Collected 19.viii.1937.
4. Holotype, *Zerene eurydice* ab. *nigrocapitata* ab. n.; collected 19.vii.1935.
5. Reared from a larva; emerged 29.vii.1933.
6. Holotype, *Zerene eurydice* form *marginata* form. n.; collected 31.vii.1938.
7. Collected 26.viii.1937.
8. Collected 26.vii.1933.
9. Collected 19.viii.1935.

Plate 2.

Fig. 1. Holotype, *Zerene eurydice* ab. *flavolineata* ab. n.; reared from a larva; emerged 12.viii.1933.
2. Collected 6.vii.1933.
3. Collected 11.vii.1937.
4. Collected 22.vii.1932.
5. Collected 9.vii.1937.
6. Collected 12.vii.1933.
7. Collected 19.viii.1937.
8. Holotype, *Zerene eurydice* form *rubrosuffusa* form. n.; collected 13.vii.1929.
9. Paratype No. 1, *Zerene eurydice* form *rubrosuffusa* form. n., superior surface; collected 23.vii.1935.

Plate 3.

Fig. 1. Collected 10.vii.1926.
2. Collected 22.vii.1932.
3. Collected 12.vii.1928.
4. Collected 13.vii.1926.
5. Collected 13.vii.1933.
6. Collected 9.vii.1937.
7. Paratype No. 1, *Zerene eurydice* form *rubrosuffusa* form. n., inferior surface, collected 23.vii.1935.
8. Collected 26.viii.1935.

Larvae.

Fig. a. Collected 15.vii.1937.
Fig. b. Collected 15.vii.1937.
Fig. c. Collected 7.viii.1938.